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ABSTRACT

This compilation of 11 program descriptions examines effective uses of educational technology with students with special needs. Central Kitsap School District in Silverdale, Washington, developed "Strategy 2020" to restructure the delivery of instruction through extensive use of technology. Toms River (New Jersey) Regional School District has special needs students use technology to produce multimedia projects while improving their communication skills, motivation, and self-esteem. Evesham Township Schools (Marlton, New Jersey) uses speedwriting, computers, and audiotape recorders to improve study skills of students with mild disabilities. St. Bernardine's Head Start Center (Baltimore, Maryland) implemented a program to foster language development, communications skills, and self-esteem of preschool at-risk and language-delayed children and the vocational skills of their parents in a mixed generation instructional setting. Enumclaw (Washington) School District has established Integrated Technology Classrooms where special needs students develop multimedia projects. Norfolk (Virginia) Public Schools created a staff position to provide assistance in facilitating full inclusion of special needs students. Bucks County (Pennsylvania) Intermediate Unit provides technical assistance to teachers through an itinerant specialist who serves 13 districts. Crestwood Community School District (Mantua, Ohio) applies switch technology with its students with profound disabilities. Marion (Arkansas) School District uses videodisc and other media to support mainstreamed mildly disabled junior-high students in their academic classes. Palm Beach County (Florida) School District combines screen reading and voice input software and hardware with electronic telecommunications. The Resource Materials Center for the Hearing Impaired in St. Augustine, Florida provides resources, technical assistance, and training to teachers. (JDD)

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Success with Technology:

Profiles of Practices for Students with Special Needs

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Success with Technology:

***Profiles of Practices for
Students with Special Needs***

Success with Technology

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CENTRAL KITSAP SCHOOL DISTRICT

Use of Technology in Restructuring the Delivery of Instruction

To better meet the needs of all students, technology has been used extensively in the restructuring of the delivery of instruction. This commitment to change involves administrators and staff at all levels in the decision making process.

Practice

Over the last half-decade the Central Kitsap School District has been developing a clear statement of mission and implementing a restructuring of instruction through new approaches and new technology. The district has named this vision for the future "Strategy 2020." Strategy 2020 is a far-reaching approach to "creating a culture for meaningful change." Many administrators in the district refer to this significant alteration in thinking about schools and teaching as "paradigm shifts." This effort in Central Kitsap has been teacher-driven and is by its very nature broad in scope. The types of changes envisioned include how funds are allocated, extensive training of teachers, using building-level management, being more student-centered, and changing methods of educational delivery.

The 2020 philosophy grew out of the district's interest in creating an environment to improve education, one that would continually be responsive to changes in society, and capable of providing students with necessary skills. Use of technology is a key factor in being able to accomplish the mission the district has set for itself. Superintendent Eugene Hertzke, who is leading this change effort, finds that it is not possible to isolate technology and restructuring. In his view, one can use technology without restructuring; but one cannot restructure without technology. They work together to help teachers work smarter and more efficiently. Although the district's emphasis is clearly high-tech, it is also

child-centered—a combination of "high tech, high touch."

Not all elementary schools in the Central Kitsap District are at the same level of technology use. The brand new schools (Silver Ridge and Cougar Valley) were designed to accommodate the latest equipment. Other schools are being retrofitted or modernized on a gradual basis. One reason for phasing in technology in the various district schools was, of course, cost; but another important consideration was obsolescence.

Site-based management is a reality in Central Kitsap. It occurs in terms of curriculum, planning, utilization of staff, budget, training, and even deciding the length of the school day. This orientation makes possible an individualized approach to implementing the 2020 recommendations and accepting the phase-in of the setup of computer networks. The general thinking is that each building is unique; some are more ready and willing than others to implement change through significant acquisitions of technology.

Much of the discussion of the 2020 strategy does not deal with special education as a distinct topic. Specifically, the published document (*Strategy 2020*, 3rd edition, January 1991) calls for special education students to "be educated in their regular home-school classroom with non-handicapped peers to the maximum extent possible." In practice students with special needs often are integrated into regular education classrooms. This approach is called "blending" by the district. It is carried out in the elementary

schools by providing additional support by a special education teacher or other professional to the regular classroom teacher; the method of assistance is determined by these two individuals, and various models occur within the district or even within a building. For the secondary schools there is also a recommendation for blending where appropriate. This level still has more self-contained classes than the elementary level, but new approaches are being tested.

Planning and Implementation

The district's refinement of its mission statements and their concerted efforts to implement them have evolved over the years. The district was initially motivated by the publication of "A Nation at Risk" in 1983. A community-based task force took an in-depth look at the school system with a view to what is needed to sustain excellence into the 21st Century. The publication of their recommendations is described by the district in the report as "the genesis for an upward spiral of self-examination and renewal." Included in these subsequent efforts were task forces on technology and at-risk students, and a futures symposium featuring three nationally prominent futurists, whose participation was funded, as a district requirement, by the architects who were involved in new school construction. After the symposium participants asked themselves, "What do we want to do with the results?" This is when the formal development of the 2020 plan began. "Strategy 2020" is now in its fourth year. The first year examined elementary schools; the second, secondary education; in the third year individual building plans were developed; and in 1991-92, these plans are being implemented.

Development of the 2020 plan began organizationally with the establishment of the steering committee and a process for teacher and community participation. The administration's

support was primarily in providing time for people to meet and course credit for the work that was being accomplished. Three major groups ("strands") were established: instructional, organizational, and support. Under these groups topic committees were formed on such topics as technology, thinking skills, curriculum integration, and instructional strategies. The participants were told to build a *process* to enable future work, and were encouraged to break old paradigms. As these groups got into their work in earnest, they had need for additional organizational support. In response, the administration created the coordinator position to facilitate the 2020 work.

The decision to create the 2020 coordinator role firmly established administration support for the efforts of all who were committing their time and energy to the study of change. The model for creating a culture for change is described by Ron Gillespie, who became the 2020 coordinator, as "top down support, bottom up participation." Gillespie's previous association with the teachers' union underscores the cooperative relationship that developed between the administration and the union.

Significant support was given to the restructuring efforts when voters approved a bond initiative to provide a major infusion of computers into the school system. The decision was made to put a computer on every teacher's desk. The planners felt that until they had a staff committed to and using computers, the district would not be able to move as far as they wanted in student use for instructional purposes. Providing teachers with an electronic mail system was another way to move the teacher out of the isolation of the classroom.

The initial focus of thinking about transforming education was the two new schools—Cougar Valley and Silver Ridge. These new facilities provided the physical plant to accommodate

changes in the district's approach to education. Each also involved a major acquisition of computers (over 250) and other technology (including televisions, video cameras, and VCRs). They were perceived to be a kind of pilot. Because staff from the whole district worked on setting up the framework, all schools had some buy-in to what was created. The district's overall strategy was to use the "best practices" within the system as they were desired by the staff of individual schools.

As a result of his experience with the Central Kitsap district, Dr. Hertzke has some advice about promoting change in a school system. He thinks it is important to have a philosophical commitment to share power from the school board and the superintendent. His personal approach is to be collaborative, to solve problems with the help of many. He points to the importance of the school board's resolution, passed in 1988, in support of the 2020 efforts, which signaled that the elected officials were willing to take risks.

Benefits

Superintendent Hertzke, in reviewing what has been accomplished in recent years, notes that primarily "we have done it on our own" by reordering priorities and convincing the community it was something they should do. In terms of evaluating the results, he considers that the district needs to be accountable to the community. Accountability is part of the budgeting process.

The superintendent said that data from other places can be used to evaluate programs that have been put in place—for example, the integrated learning systems. He believes that because it is hard for people to accept outside data, collecting your own district's data is helpful. Several internal studies confirmed increased academic performance, and more

importantly, accomplishment of some of the restructuring goals not measurable on standardized achievement tests.

Steve Anderson and B.J. Wise, principals from the newest elementary schools, along with Kim Marcum of Jackson Park and Pam Johnson of Esquire Hills (two schools that have not received such a massive infusion of technology) were interviewed. All principals were enthusiastic about the changes that have been taking place in the district. They find their teachers are working exceedingly hard and are fully committed to meeting the needs of their increasingly diverse student population. Their evaluation of the increased use of technology and a school climate that is receptive to attempting new approaches is very positive. They assert that teachers are able to individualize instruction for students and meet their needs better than ever before.

Executive director Terry Bergeson, who supervises principals, identifies the leadership of principals as crucial to making changes to serve at-risk youth, and especially special education and minority youth "whose families don't tie into the mainstream system." Supported by unit-based management, principals interact with their staffs to make decisions that are based on the local school and the local community needs. The flexibility afforded each building fosters a cooperative spirit within the school and promotes the feeling that they can control many factors that affect their performance.

The administration has been particularly skilled in how it communicates education issues to the general public. Its efforts have enjoyed strong community and staff support. "Making a difference" and being willing to spend the time to do it is all part of the culture of this school system. It has been adopted by central office staff, principals, and classroom teachers in Central Kitsap. Additionally, the district has been able to maximize its own efforts by

building a series of partnerships with commercial firms and by promoting volunteerism through the employers in the community.

Summary

The Central Kitsap district has an overall vision of where it wants to go and the variety of changes that need to be made to accomplish their goals. The vision is clearly articulated, actively employed, and understood and supported at building principal and staff levels. This vision includes the integration of students with disabilities in regular education classes to the fullest extent possible.

- District size (grades K through 12):
Number of students: 11,000
- Number of students receiving special education services: 1185
- Number of special education teachers: 42
- Disability classifications: All
- Curricular areas: All academic subjects
- Technology employed: Computer, local area networks, videodiscs, VCRs, camcorders, telecommunications. Some schools employ curriculum-based software delivered via the Jostens Integrated Learning System

TOMS RIVER REGIONAL SCHOOL DISTRICT

Multimedia Projects by Students

Holding to a child-centered philosophy and a belief in multisensory education has allowed the smooth integration of multimedia projects that improve the communication skills, motivation, and self-esteem of students with special needs. A mission statement or statement of educational philosophy can unify staff and support the introduction of a variety of applications of technology.

Practice

The Toms River Regional School District personnel are united in their belief that the child should come first in all school decisions. To ensure this, school administrators expect educators in the district to explore and try new methods and tools without fear of failing. Additionally, special educators believe that special education programs will be successful if they rely on a multisensory approach to learning and teaching.

One example incorporating these ideas is found in an intermediate school in Toms River. At Intermediate East, students who receive special education services develop multimedia projects as they pursue classroom objectives.

Lynn Regan, the resource room teacher at Intermediate East, had identified a general need of her students to further develop their communication skills. She created a variety of learning spaces in her school's resource room to take advantage of the different learning styles of her students. These spaces were organized around several Apple II computers, tape recordings of books, various print materials, and other media. She continued to search for new and stimulating projects to keep up her students' motivation as well as her own. With assistance from others in the district and a new IBM computer lab, the use of multimedia became the focus of the resource room in the 1988/89 school year.

Student projects include writing scripts and performing reviews of television shows on-camera, producing mock newspapers from the future, making video news reports and print newsletters, and developing instructional videos and software. Some of these projects are shown on the school's closed circuit television channel and others on the district's television station. Writing is encouraged through the use of computers and oral skills are developed through live and recorded presentations of written work.

Planning and Implementation

In the spring of 1988, Diane Pullen, the district's intermediate learning disabilities teacher consultant, became aware of a workshop on the use of multimedia with special education students. Pullen knew that Lynn Regan was using computers and other technology with assistance from Glenn Anderson, the K-8 technology coordinator. Together, Pullen and Regan requested permission from Larry McCauley, the district's intermediate special education supervisor, to attend the workshop.

Based on the likelihood the proposed effort could be sustained and that it supported a multisensory approach to educating, McCauley agreed to help them get approval and funding from the district for attending the workshop and for developing the initiative. Support was sought from and given by John Fitzgerald, the school principal, John Gluck, the district special education director, and Al Dietrich, the superintendent.

Following the 1988 workshop, Regan and Pullen developed a project in which students wrote stories on computers. Then they added sounds and graphics to the stories on the computers. The completed stories were transferred to videotape and a copy was given to each student. In 1989-90, a digitizing camera was added. Students could then add still shots to their computer files.

Because of her success, Regan's schedule was adjusted in the following year. Instead of six periods a day as the school resource room teacher, she taught five periods of resource room students and one period a day with the self-contained special education classes.

With suggestions from Glenn Anderson, McCauley, and Pullen, the practice developed quickly. Regan's students presented their stories to a nearby elementary school. Regan also organized a "Meet the Authors" event in the school's intermediate library to show the rest of the school what her students had been doing. The regular students and teachers were impressed with the projects, helping to increase the special education students' self-confidence.

Also during the 1989-90 school year, an IBM PS/2 computer lab was installed in the school as a result of Regan's selection as the IBM and *Technology and Learning* 1990 Teacher of the Year. With receipt of the new hardware and software, a new and larger space in the intermediate school was found for the 20 networked computers, the printers, and the other related equipment.

In the following school year, 1990-91, Regan's schedule was adjusted again. She now teaches resource room students four of six periods a day and self-contained classes two periods a day as the technology-assisted communication teacher. During these two periods, the classes work on projects that have been developed by Regan in

cooperation with subject area teachers.

Not only has the district created a philosophy and an environment and provided the resources to foster this project, it has provided the necessary staff to provide training and technical assistance. About 6 years ago, senior staff in the district realized that the need for technical support exceeded the then single position of K-12 technology coordinator. The new position of K-8 technology coordinator was created. Glenn Anderson, at the time an elementary teacher who had technical expertise with computers, was chosen as the new K-8 technology coordinator to provide technical support for teachers.

Anderson stressed that his background as an elementary teacher developed the "generalist outlook" that comes from having to teach all types of students all subjects. He believes this trait is useful in his current job of selecting software and hardware and providing technical assistance and training. Anderson also aggressively searches for sources of funds to support and extend the use of technology.

Equally important to Regan was McCauley's providing the necessary equipment and resources. The video cameras that are integral to the practice, for example, had been acquired by the intermediate school at about the same time Regan began multimedia projects. Even though they were originally for science education, McCauley allowed them to be used for other projects. "These cameras are here for everybody," he said. "The science project has priority, but everybody else can use them too." If this had not been the case, Regan would not have been able to follow through on some of Anderson's and Pullen's ideas.

The picture of this district must include the sense that people openly and honestly talk with each other. They share the same educational values and approach to special education instruction,

and they support each others' efforts. Superintendent Dietrich has been very involved in the purposeful hiring of administrators and teachers who agreed with the philosophy of child-centered education, experimental approaches to development, and multisensory education, according to Fitzgerald.

In 1991, Superintendent Dietrich retired and was he was replaced by his former assistant superintendent, Michael Ritako. This placement has helped to ensure the continuation of the established district educational philosophy. Frequent formal and informal communication also reinforces this unified view.

One formal way the special education supervisors communicate is during a scheduled meeting held weekly. The meeting includes Special Education Director Gluck and the special education supervisors, including McCauley. This meeting was formed to increase the coordination, integration, and effectiveness of all special education practices in the schools. It has also helped to establish a relationship among the special education supervisors so that they will informally contact each other to share their ideas and ask questions. According to McCauley, Gluck said, "You're here to share what you do." Reflecting on this, McCauley said, "If I'm doing something good with my teachers, it's really not as sweet a victory if I haven't told the folks next door about it."

The success of the practice was due to the teachers' willingness to try adopt the new materials and methods. They said this willingness to try new ideas was not necessarily specific to this practice, but was a general open-minded attitude. As long as it is in line with their overall approach to special education, and contributes to the program, teachers are willing to experiment with new ideas and methods.

The self-contained special education classroom teachers stressed that they relied a great deal on Regan's knowledge and experience. This was especially true when they switched to the IBM computers. She in turn relied on the assistance in multimedia she received in the beginning from Anderson, from graduate courses, and from workshops.

Regan holds workshops to train the self-contained special education classroom teachers at Intermediate East in creating multimedia projects. Early on, the teachers had learned the software and network by literally sitting next to their students. In some ways, they said, this increased the self-confidence of some students and also increased their willingness to experiment with the technology. Now, workshops are held by Regan to orient regular and special education teachers new to the network and software.

Benefits

Intermediate special education supervisor McCauley sees evidence of the program's effectiveness in the products of the special education students. He says they are clearly superior in complexity and overall quality to anything the teachers had produced before.

The practice appears to have increased the special education students' confidence and motivation to learn as hoped. In addition, the communication skills of the self-contained classroom students and the resource room students have improved. Since the introduction of multimedia projects, 70 percent of the mainstreamed students have passed the writing portion of a practice version of the New Jersey High School Proficiency Test, as opposed to 20 percent prior to the practice. Regan also points to three of her multimedia resource room students who have entered regular high school English classes after they left the intermediate

school. Two other students have entered regular English classes at the end of ninth grade.

Lynn Regan herself feels rejuvenated by the infinite variety of instructional projects that can be adopted to the curriculum. Her motivation to teach has been renewed as a result of adding the technology to her position and new ways of interacting with her students that it allows. She said,

Technology definitely has changed my role as a teacher. You are no longer the lecturer, the giver of information. You are now the facilitator, allowing kids to take more control over their education.

Summary

The success of the practice seems to have reinforced the same district values that allowed the practice to come about in the first place. The child-centered philosophy in district and school decisions, supported by the freedom to experiment, and coupled with a firm belief in a multisensory approach to special education, have all helped the successful integration of multimedia into this program. This success in turn increases the likelihood of implementation of other promising initiatives.

- District size (grades K through 12): Number of teachers: 1,000; Number of students: 16,000
- School size of practice location (grades 7 through 8): Number of teachers: 100; Number of students: 1,500
- Percent of students receiving special education services: 9
- Grade level of students in practice: 7 through 8
- Disability classification of students: Mildly disabled students
- Curricular areas: All, including English, reading, science, mathematics, social studies, and career education
- Technology employed: Computers, camcorder, video player/recorder, and digitizing camera

EVESHAM TOWNSHIP SCHOOLS

A Study Skills Program Incorporating Speedwriting, Computers, and Audiotape Recorders

To improve the study skills of students with mild disabilities and improve their performance in mainstream classes, a program involving the use of speedwriting, computers, and audiotape recorders has been implemented. This program was introduced into a school climate that is supportive of innovation and experimentation.

Practice

The study skills program was begun to give classified students the skills necessary to operate successfully in mainstream classes. This involves developing the skills that are needed for the students to become independent learners. The program includes a form of shorthand called speedwriting, dictation into an audiotape recorder, keyboarding training, and word processing.

Every perceptually impaired (PI) class in grades 3 through 8 in this K-8 district receives instruction in speedwriting and keyboarding. Elementary students receive this instruction as part of their regular daily instruction in the special education classroom. Middle school students are assigned one period each day to a class known as Skills for Independent Learning.

Students learn speedwriting in formal lessons designed by Cathy Hinney and Pat Behen, the lead teachers involved in the practice. These lessons were adapted specifically for younger students from a program originally developed for use with high school students. The students also learn it informally through motivating classroom activities and peer tutoring. They learn keyboarding and word processing through regular practice on Apple IIe computers with age-appropriate software. Specifically, students use Type to Learn for keyboarding instruction and C.C. Writer as the word processing program.

The students involved are encouraged to use

speedwriting in all note-taking situations, whether in special education or mainstream classes. They complete their assignments by audiotaping the notes and then transcribing them with a word processing package. The keyboarding and word processing skills they acquire are also useful for completing other types of assignments, particularly compositions and reports.

Norm Allison, who was the principal at the elementary school where the practice began, described the program and its benefits:

After several years of speedwriting, when it becomes automatic, the students are able to take notes better than other students in the class. But the second part of the program is that every night when they get home they take their speedwriting notes and dictate into a tape recorder. That does two things. Number one, it reinforces that day's lesson, which is just good study habits for any student. But, number two, when it comes time for a test, instead of having to go back to the written word, they learn by hearing their own notes being read back to them. It's an auditory reinforcement, which is generally a strength for these students. They're now prepared for their test because they have better notes and they've had oral reinforcement. And, the third part is actually getting the written word out, and there we use word processing and typing. We make sure the youngsters learn the proper technique. By having the youngsters be able to type, they don't have to worry about all those manual things that have been discouraging them. What we have found is that students who previously would not write, students

with extreme deficiencies, are now students who ask the teacher 'Can we write?' 'Can we do letters today?' 'Can we do composition today?'

The practice focuses on developing skills that can be used in a variety of ways to help these students with mild disabilities succeed in current and future life situations. The manner in which the skills are taught adds to the acceptance by the students involved. There is no pressure, no grade, and the use of speedwriting is not mandatory. Rather it is seen as a tool available to the students.

Planning and Implementation

During a visit to the regional high school in 1988, Allison, then principal of Evans Elementary School, noticed that the high school PI students were the same students who had been in special education when they were in his elementary school. He wondered why these students, who should have been able to succeed, were still spending most of their school day in special education classes. He wanted to change this and help the students move out of the special education setting and succeed in regular classes.

Allison had the support of the superintendent of Evesham Township Schools, Leroy Meland, to try the new program. Dr. Meland said:

We were looking for something to make a difference with perceptually impaired children, because the numbers of children were growing. We had to try something to make some kind of a difference. [The study skills program] was an opportunity to try something. The principals pilot different things in different schools. We give them the opportunity to try, and even if it fails you learn something from the failure.

Allison enlisted the aid of Behen and Hinney who were special education teachers at Evans. Together, they identified the skills that students

need in order to be successful and strategies to help develop them. By comparing the strengths and weaknesses of PI students, and by looking at how students are instructed in the upper elementary and middle grades, they saw that students receive more verbal instructions, and more classes have a lecture format that requires note taking. Some PI students have poor motor control, and the notes they take often are illegible. If they can write neatly, it takes a considerable amount of time, too much time for them to keep up with the lecture. Note taking and studying from these notes were identified as fundamental skills that PI students need to succeed in mainstream classes.

Behen and Hinney believed that becoming proficient in some kind of shorthand would be the most difficult skill for the students to master. However, excited by the prospect of trying something that might make a difference for these students, they worked hard at planning numerous lessons and activities using speedwriting. Speedwriting is only one of several types of shorthand. Rather than using unfamiliar symbols, speedwriting uses the standard alphabetic characters, but drops letters according to a set of rules to make writing much faster. Behen and Hinney could find no existing method of shorthand that was considered truly age-appropriate. They chose this alphabetic form because it seemed to be the easiest to learn.

Having decided to use it, they realized they would have to adapt the lessons. Because it was available in their district, Behen and Hinney used *Principles of Speedwriting and Shorthand* (Glencoe Publishers), the speedwriting text for area high schools, as their starting point. During the summer of 1988, they transformed the reading level of the text from high school to third, fourth, and fifth grade levels.

They limited the amount of speedwriting information presented at one time so that each

lesson ended with the students "wanting more." For example, they began by putting jokes or puns in speedwriting on the blackboard, with no further comment or explanation. Students were curious and inquired about the "funny writing." This allowed them to initiate the lessons. Also, signs were put up around the school labelling things in both English and speedwriting. This generated interest in the other teachers and regular education students. It also gave the program attention within the school, contributing to increased acceptance by others.

In the beginning of the first year, the focus of the program was primarily on the speedwriting component of the program. However, during the course of the year, other elements of the practice were added. These included the use of the audiotape recorders, keyboarding training, and learning to use a word processor to transcribe notes and for other purposes such as composition assignments.

The equipment required to implement this program had a relatively low cost to the district. Implementation was not dependent on selecting and acquiring expensive or unusual hardware or software. This practice made new use of some technology the district already owned. The school had some of the computers needed for keyboard training and word processing. There were many suitable keyboarding training and word processing programs available at relatively low cost. They selected one that seemed to be a good match given the students' ages and the equipment available. The microcassette recorders were obtained at relatively low cost and purchased with school funds.

In the pilot 1988/89 school year, the project exceeded all expectations. The students were able to learn the speedwriting much more quickly and easily than they had expected. There seemed to be absolutely no negative impact on the spelling of the students involved,

which was one concern expressed by some. And the technology employed in the practice allowed the students to complete their work much more quickly and easily. All of this led to rapid changes in behavior and school performance for some students.

The following year, the project's scope was broadened to include more classes. In the 1989/90 school year, it became mandatory for PI teachers at Evans to learn speedwriting and teach it in their classes.

In 1990, Allison and Hinney both moved to the middle school, Allison as principal and Hinney as a teacher. In this way, the practice became established at the middle school level. Allison established the middle school study skills class, Skills for Independent Learning. Hinney was assigned to teach all sections of this class, allowing her to focus on it, working with regular education teachers who had mainstreamed students in their classes, and providing support to other PI teachers.

With support from Judy Simkin, director of special education, and superintendent Leroy Meland, the program is now in place in all of the district's schools. Behen and Hinney have continued to develop the curriculum for speedwriting during the summer, with input from other teachers. They are also responsible for providing inservice training and workshops in speedwriting to teachers in the district.

Implementing this program involved a cooperative working effort across various roles—the superintendent, principal, special education director, teachers, and parents. Allison said that when they started they "didn't have any guarantees for the parents, but we also didn't have anything to lose, and we thought our theory was good." He had clear support from the superintendent, Meland, who said to Allison, "You weren't afraid to fail. I think the beauty of

it was that you were willing to try it and you had the opportunity to fail. And you felt there was no real loss in trying something and falling down."

Benefits

Sharon Davis and Donna Hathaway, two researchers from Glassboro State University, evaluated the progress of the students during the first year. They found statistically significant increases in some reading comprehension and written language measures at the third grade level. The third graders also demonstrated significantly higher achievements in thematic maturity, contextual style, and spontaneous writing quotient. The fifth graders had significantly higher achievements in spelling and style. All of the parents reported being either "highly satisfied" or "somewhat satisfied." Their findings were used by advocates of the program to convince others of its effectiveness. This helped to increase and encourage the acceptance and growth of the practice.

Most parents believe that their children "love school now." They feel the "double reinforcement" of taking notes in speedwriting and transcribing them might be the biggest factor in the success their children have experienced. They report that many of their children are doing reports independently, passing tests, and moving from failing grades to As and Bs. They also feel pleased that their children now have much better self-esteem.

Since this practice was begun, students' writing and composition skills have improved notably. The keyboarding and word processing skills have contributed to this, since it is now much easier for students to edit and produce a nice looking document of which they can be proud. However, in addition, some students who used to hate to write are now using their speedwriting to write spontaneously and independently during the

summer by keeping journals or adopting pen pals.

Summary

This practice was begun to give mildly handicapped students the skills they need to be successful in their mainstream classes. Parents and staff believe that the students involved in the program have benefitted tremendously. The combination of speedwriting, audiotape recorders, and computers required a substantial change in program at both the elementary and middle school levels. However, this change was facilitated by a district climate that is extremely supportive of innovative practice.

- District size (grades K through 8):
Number of teachers: 250; Number of students: 4,000
- Percent of students receiving special education services: 10
- Grade level of students in practice: 3 through 8
- Disability classification of students:
Perceptually impaired (learning disabled)
- Curricular areas: Study skills, language arts, science, and social studies
- Technology employed: Computers and audiotape recorders

ST. BERNARDINE'S HEAD START CENTER

Computers in a Mixed Generation Educational Setting

To foster the language development, communications skills, and self-esteem of preschool at-risk and language-delayed children *and* to improve the basic and vocational skills of their parents, computers are used extensively in this mixed generation instructional setting. Implementing goals such as these demands good planning to ensure that appropriate equipment is accessible and well utilized.

Practice

The staff of the St. Bernardine's Head Start Center believes that to have real influence on the life of a child, it is necessary to make an impact on the child's family. Integral to the philosophy of the center is the idea that the parent or guardian is the primary educator of children. Sheila Tucker, the director of St. Bernardine's, has created a comprehensive mixed generation educational setting for the children and adults in her service area. Adult learning activities occupy the same building as the preschool. And the computers throughout the center are the catalyst for many activities in the preschool and adult programs.

Adult Program. Sheila Tucker has made increasing families' self-sufficiency one of the major goals of this Head Start center. Adult education and work readiness training programs are available on site to prepare community adults for self-sufficiency. Classes include Literacy, G.E.D. Preparation, Adult Basic Education, and Information Processing and Computer Literacy.

Computers are an important part of the center's adult education program. Because students are functioning on many different levels and have various educational goals, it is important to have the capability of individualizing instruction. The computers and a variety of software allow the center to meet the needs of many learners in an efficient and cost-effective manner.

Approximately 20 computers are placed in a

single room in a computer lab arrangement. Classes come into the lab on a regular schedule. Both traditional computer-assisted instruction and interactive videodisc are in use in this lab. Tutorial and drill and practice software are used to build language and mathematics skills at both basic skills and G.E.D. preparation levels. Specifically, the *PALS* adult literacy program and *Skills Bank* software play a major role in the program. Interactive videodisc is also used to teach essential employment readiness skills. Interested students also learn to work with a variety of tool software to become prepared for word processing and other computer-related office jobs.

Preschool Program. Although computers are used to help teach all students basic concepts and pre-readiness skills, a primary use of computers is to increase and improve children's expressive and receptive language. Tucker believes this is of major importance, given that "speech and language deficiencies account for over 60 percent of all handicapping conditions in the Head Start population." According to Tucker, over 80 percent of the children receiving special education services in Baltimore Head Start programs had speech and language deficits as their primary disabling condition in the 1989-1990 school year.

In order to remedy the significant speech and language delays of some students, a special class and program have been established. Seven of the students in this class are formally identified

as speech and language delayed. Some have additional disabilities such as health impairments, mild mental retardation, or behavior disorders.

The premise of the Language Enhancement Model Classroom is that, to foster language development, it is necessary to put children in a language-rich environment that provides many opportunities to hear and use language. Because many of the children speak nonstandard English, the goal is to teach standard English while validating as a legitimate language the nonstandard form spoken by some students.

The school day alternates between structured whole class activities and free choice periods. During the free choice periods, the children choose activities from the seven interest centers: manipulatives, housekeeping, art, a water table, a sand table, a library, and computers. Thus, the computer area is viewed as simply another classroom activity center. During free play periods, children move in and out of the computer center just as they do the other activity centers in the room.

St. Bernardine's uses materials packaged for teachers by Mobius. A map, several picture books, and posters facilitate the use of specific software programs with early childhood themes. An extensive curriculum integration guide and a technical reference manual completed this *Kids' Ware* package. A graphical interface allows the children to use the software with little training or assistance.

A number of the programs focus on the development of language skills. *Fun with Letters and Words*, for instance, shows a picture and blinks the name of the picture. Then it pronounces the word, and asks the child to repeat it. According to staff, the children rarely have to be prompted to speak to the computer. The children seem to enjoy speaking to the computer and having it talk back. These

programs also generate a good deal of conversation between students and adults working with them. The software is exploratory and discovery based. It is noncompetitive and there are no right or wrong answers. Two complete sets of diskettes for each software program ensure that students never need to compete for a program.

Other types of technology are also available in the classroom for student use. These too are intended to stimulate expressive and receptive language development. A tape recorder, a record player, and a Language Master are among these.

However, the technology is only part of what makes the Language Enhancement Model classroom special. In order for a child to be placed in this classroom, one of the child's parents or guardians must volunteer in the classroom every week and complete a classroom volunteer training course. Parents and guardians are taught how to encourage discussions with their child, develop their child's listening skills, and increase their child's expressions of their individuality. The presence of parents and guardians adds more one-on-one interaction between children and adults, giving children more opportunities to communicate with adults.

Planning and Implementation

The St. Bernardine's preschool program uses materials packaged by Mobius, obtained when the center was a site for an IBM/Head Start Partnership Project. While participating in the Partnership Project, staff at the center noticed the children were more verbal when working on the computers. Computers seemed to be a natural vehicle for stimulating communications among and between students, staff and parents. This led to the staff's identifying computer technology as especially appropriate for incorporation into the Language Enhancement classroom.

Each classroom at St. Bernardine's Center, including the Language Enhancement Model classroom, received two computers, a printer shared between them through a switchbox, and software. The computers are equipped with mice, touch pads, and voice cards capable of producing both synthesized and digitized speech. Color monitors display high quality graphics. Most software operates with a mouse, a touchpad overlay, or a limited number of keys, such as the directional arrows. The computers were donated to St. Bernardine's when the Partnership Project ended.

Basic training of teachers in using the computers was coordinated by representatives from Mobius Corporation during the 1988-89 school year. Since the end of the Partnership Project, the responsibility for training has been assumed by Barbara Curtis, a member of the center's consultant team.

Training in using technology to promote language development is ongoing. All the educational programs at the center are advised by a team of consultants. Members of this consulting team commonly assist in the classroom. The team includes a mental health specialist, a speech and language consultant, and a special education resource teacher. While working in the preschool classrooms, consultants model instructional techniques for parents and teachers. Thus, informal training occurs throughout the school day as teachers and volunteers look over the shoulder of a consultant working with a child. Typically, the child chooses an activity, and the consultant, such as a speech pathologist, works with the child in the chosen activity center—such as the computer center.

Staff noticed the enthusiasm of the children and their parents when working at the computers in preschool classrooms and thought that perhaps computer technology could also contribute to

their adult program. The director, Sheila Tucker, contacted IBM and obtained support from them. This, along with support from Project Independence, allowed them to open a full lab with a variety of tutorial, drill and practice and videodisc software. IBM supported this effort by providing technical assistance to set up the lab. They also supported training for key staff.

Benefits

Staff at St. Bernardine's believe that children in the Language Enhancement Model classroom have substantially improved in reading readiness and general language development. Overall, these children made greater gains than children in any other classroom in the center during the 1990-91 school year. They demonstrate much richer and more complex communication skills after one year in the class. They particularly demonstrate enormous pride in learning the new skills associated with operating the computers.

The pride and ownership that the children feel toward their work on the computer is contagious and stimulates parents' interest. The computers allow parents who are volunteering in the classroom to see their children as confident, competent learners. This gives parents and children the opportunity to interact around a task exciting for both. Dr. Linda Tsantis, a researcher who participated in the project, wrote in an unpublished manuscript that the students:

[Demonstrated] more robust language, describing, for example, how they had used a program about gardens to prepare the soil to help the plants grow. ... Many children exhibited leadership skills and levels of confidence not witnessed in other learning centers. Even children whose energy and interest were often difficult to harness were reported to be far more motivated, compliant, and happy when working on the computer.

The addition of computers to the adult program has allowed the center to meet the diverse needs

of its learners more efficiently. Staff with previous experience in similar programs that do not use computers have noted that students in this program seem to enjoy the increased control over their learning and are more motivated to learn.

Summary

The St. Bernardine's Head Start Center has effectively integrated technology into the total program. Microcomputer technology is readily available to both preschool and adult learners, largely through the efforts of the director and staff who secured the necessary resources. In both cases, the technology has contributed to the students' levels of achievement and motivation.

Center size

Number of preschool teachers: 9;
Number of preschool students: 173;
Number of adult education staff: 8;
Number of adult students: 138

Preschool Program

- Age level of students in practice: 4 through 5
- Disability classification of students:
- At-risk and language delayed
- Curricular areas: Language arts
- Technology employed: Computers, exploratory educational software

Adult Program

- Curricular areas: Literacy, basic skills, G.E.D. preparation, vocational preparation
- Technology employed: Computers; interactive videodisc; tool, tutorial, and drill and practice computer software

ENUMCLAW SCHOOL DISTRICT

Multimedia In an Integrated Curriculum

To help students with developmental delays and mental retardation acquire new knowledge and skills, students develop multimedia projects within the context of an integrated curriculum. Acquiring resources to establish the Integrated Technology Classrooms (ITCs) has been a challenge but a variety of mechanisms have enabled the program to succeed and the administration is planning for its expansion.

Practice

As part of a broad-based effort in to prepare students for the future and to restructure its approach to teaching, the Enumclaw School District is testing various pilot programs and building model classrooms within the district. The superintendent, Dr. James Barcheck, believes that developing good models is the best and most effective way to encourage and support people who want to innovate. The overall philosophy of the district focuses on programs that are student centered, based on a team approach, aimed at lifelong learning, responsive to change and needs, and prepared to deal with the whole student. A model program that meets these goals—the Integrated Technology Classroom (ITC)—is being piloted in each of the elementary schools in the district.

Laura Sanders has created an ITC in her self-contained primary special education class at Westwood Elementary. The multimedia equipment utilized includes two Macintoshes, two Apple IIs, a camcorder purchased by the PTA, and a multimedia cart (with a Macintosh, a CD-ROM drive, a videodisc player, and a color monitor). Sanders and her instructional aide, Joann Harris, have identified reading, problem-solving, independence skills, and social skills as focal points for the new curriculum developed for this class. Sanders encourages her students to "explore, discover, figure it out," and they readily employ the technology in their class activities.

Sanders employs a unifying topic to structure her lessons. In the first year it was mammals and the following year animals; she plans to use people (like bakers and pilots) as the central topic next year. An animal whose name begins with a specified letter is selected by a student. The class then views a segment of a laser disc featuring the animal (often from the *Encyclopedia of Animals*). Books focusing on the chosen animal are read aloud, and books with pictures of the subject are viewed. The laser disc is watched again, as well as other video tapes (from series such as National Geographic, Nova, and Discovery). This time, the students identify and generate a list of "animal facts" from the videos. The class also takes field trips to see the animals (for instance, in a zoo) or they are brought into the classroom. These events are recorded by the students with a video camera. For each mammal they learn about, the students create their own movie highlighting the animals and the facts they have learned. They do this by transferring segments of the videodiscs or videotapes they have watched and their own footage to a VCR tape. They then select music to add to the tape, and finally they pick out some facts about the animal to dub over relevant portions of the movie.

Other related language arts and mathematics activities using the computer and involving the animal are utilized. Programs used include Puppet Playhouse to create stick puppets for regular puppet shows that they present to the school's preschoolers and Once Upon a Time (both by CompuTeach) to produce their own

reading book, which is tailored to the program. Word processing with the Muppet Keyboard contributes to a large mural featuring the animal, his environment, and the animal facts. (The mural is given, by lottery, to a student to take home at the end of each animal unit.) The class is proud of their special T-shirts made with a flatbed scanner and a heat transfer ribbon in the printer to make iron-on animal pictures.

Planning and Implementation

The board of education has actively encouraged the incorporation of technology into the delivery of instruction in the Enumclaw schools. Dr. Barcheck was hired as superintendent with the expressed mission to promote technology use in the schools and funding for it in the community. Pat LeBlanc's position as technology coordinator underscores the district's commitment to technology. Assisted by Kelly Gordon, LeBlanc provides technical assistance and staff development to the teachers in all the district's schools.

The ITC classroom began in the Enumclaw district in 1989-1990 with the receipt of a 15-station Macintosh lab from Apple Computer. The lab was on loan for a year. The computers were put in a sixth grade classroom along with some additional equipment such as videodisc players, a CD-ROM, and some digitizers and scanners. After the teachers and a group of students had been trained, an assessment was made of the effect of this multimedia experiment. At the end of the year, observing the success of this model classroom, the district made plans to expand it.

The teachers (and some students) of the expanded group of ITCs were then sent for multimedia training. As the computer resource teacher for her building, Sanders was sent for training to assist others. However, she became convinced that the approaches in the ITC model

could be adopted for her special education class. After thinking through how the multimedia approach could be brought in slowly, a piece at a time, she wrote up a plan for implementation with her special population. She began with a unifying topic and then gradually added different pieces of technology to reteach and relearn and add meaning to the facts that they were developing for each mammal under study. As the year progressed, Sanders reports the students started to generalize, and to categorize; their vocabulary became enriched and more complex; and they were speaking in whole sentences. Adjectives and adverbs were added to their speech.

The district encouraged Sanders' experimentation. It is part of the district philosophy of being open to new ideas, to allow teachers to try things out, to take risks. Dr. Barcheck believes that teachers are inclined to innovate and to seek out the best for their children. Although he acknowledges that some efforts may fail when breaking new ground, he asserts, "Things don't happen in districts that don't have people to support them." Pat LeBlanc has been an important resource in backing up Sanders in her development and testing of the special program. Sanders credits her both for technical knowledge and as a source of ideas when a teacher becomes stumped.

An ITC requires a technology-rich environment to carry out the many activities and to make the many products that are part of the program. By being creative, adapting equipment, and borrowing from within her school, Sanders has been able to proceed without being an "official" ITC. She utilized the resources of the whole school to provide the necessary tools for her class. When dubbing she borrows the specialized VCR from the designated ITC at Westwood Elementary. The camcorder was purchased by the PTA. Other items are brought in as necessary—such as the school's videodisc

player, additional Macintoshes, or the school's multimedia cart. LeBlanc remarks that there is a lot of sharing back and forth between teachers, that none feel that it's all theirs and only they can use it.

Technology has been funded in the Enumclaw district through bonds approved by voters as part of a new building or remodeling expenditure. However, a 6-year levy, designed to expand greatly the second phase of the district's technology initiative, was put to the voters in February 1992, and did not pass.

Although the administration was disappointed with the vote, they are regrouping to consider how they can better inform the community of the importance of bringing technology into the classroom. As the superintendent pointed out, there is always so much more that could be done than can be afforded, so there is the constant problem of finding adequate resources. The ITC model has a high priority in the district. Pat LeBlanc reiterates the district's commitment to utilizing technology to enhance the learning of students at all grade levels. Until voters support a special levy, they will proceed with integrating technology into the classroom on a piecemeal basis—picking and choosing who gets the equipment rather than being able to do it all across the district and automatically having equity.

Benefits

The ITC set up has been effective with the developmentally delayed students in Sanders classroom. She observes that all of the students have different learning styles and because the multimedia approach at the same time will use a visual approach, an auditory approach, and a kinesthetic approach, the best learning style for each child is addressed. She reports that since she has been using this approach, their memory skills are improved, their sequencing is much

better, and they are better able to express and receive language which increases their communications skills. Their higher order thinking skills have become engaged—such as synthesizing: taking little parts of what they have learned in other places and putting them together a new whole. The students are learning to learn and loving to learn. Because they are more in control of their own program, they want to be in school. They can make as many choices as the teacher can create for them. LeBlanc also notes a tremendous increase in their interest in the world around them and in their oral communication skills. Their parents comment on their knowledge level and their interest in such television shows as Nova and Discovery.

The speech-language pathologist for the school, Peggy Warren, reports that she has seen marked changes in the children, not only in language use, but in cognitive processing, ability to function independently, and on-task engagement. Ms. Warren reports that the students' language skills have greatly matured. They initiate conversations more often than they did in the beginning of the year, and they can explain to her the content and purpose of their activities. Their vocabularies have also improved markedly. The children also attempt to read words they have not yet learned, displaying confidence.

Formal testing supported the observed improvements in the children's performance. The scores of the children on the Battelle test of social and emotional growth showed a full year's progress during the school term. The students are more confident, more socialized, and more independent in their actions. Quantitative data gathered with the Weschler Intelligence Scale for Children-Revised also demonstrate improvements.

Another benefit that Sanders reports from her own perspective is a renewed interest in teaching. Teachers as well as students get excited about the approach. She is continually

reinforced by the students' successes. She feels energized about coming to work and discovering things with the students. She is also affirmed by the district's support of her as a professional and their encouragement of her experimentation.

Sanders' comparison of student achievement in her years as a traditional special education teacher compared to achievement in her multimedia classroom centers on the effectiveness of the multimedia approach. In this setting she readily observes her students progressing, remembering, discovering, learning.

Summary

In the Enumclaw School District the superintendent, technology coordinator, principals, and classroom teachers are seeking additional tools to promote efficient and effective learning. The necessity of experimentation is acknowledged and actively encouraged. Drawing on the school's resources and her own ingenuity, Laura Sanders serves as a model of effective teaching techniques applicable to her special population.

- District size (grades K through 12):
Number of students: 4,000
- Grade level of students in practice: 1-3
- Number of students: 8
- Disability classification: Developmentally delayed/mental retardation; WISC-R scores of 40-70
- Curricular areas: All, including language arts, mathematics, science, and social studies
- Technology employed: Computers, video player/recorder, camcorder, video-disc, still camera, CD-ROM

NORFOLK PUBLIC SCHOOLS

Training and Technical Assistance for Special Education Teachers and Students

To facilitate full inclusion of special needs students, the Norfolk Public Schools department of special educational services has created a position designated to provide assistance to all special education students and teachers for technology needs. The availability of this support and training has contributed to successful technology integration in the district.

Practice

Norfolk Public Schools aims for full inclusion of all students with disabilities into all programs offered by the district, modulated by each individual student's needs and abilities. The staff believes that full inclusion is reachable with technology, but only to the extent that teachers and students know how to take advantage of it. The district department of special educational services provides personalized technology training and assistance for special education students and teachers. These services are intended to augment other technology services and regular inservicing provided by the district to all teachers.

The special education computer specialist, Pat Shubert, focuses on materials management and instructional integration. Efficient acquisition and distribution of hardware and software rests on the knowledge and abilities of the computer specialist. She is a certified special education teacher; she has personal and professional experience with the technology; she spends a great deal of time in the schools; and she attends many conferences. Additionally, she is well organized, and has knowledge of resources already in the district.

Instructional integration focuses on identifying an appropriate match among access needs, instructional needs, and technology capabilities of students and teachers. A large part of matching teachers' technology abilities involves increasing their familiarity with computers and

programs through training. Developing and delivering training is central to the position.

The specialist's experience in teaching students with learning disabilities, students with emotional disturbances, and students with mental retardation allows her to predict the likely pitfalls of bringing a particular piece of equipment into a particular mainstream classroom. She is also qualified to develop and deliver training sessions for individual teachers and targeted students, as well as provide inservice workshops for groups of teachers. She has the capability to conduct both needs assessments of individual students and teachers, and technical and practical assessments of equipment.

Shirley Underwood, director of special educational services, appointed Pat Shubert to the new position of computer specialist of the department. She was appointed to support the two identified needs: full inclusion of students with disabilities and efficient acquisition, distribution, and use of technology resources.

For every disabled student brought to her attention, Shubert assesses the instructional needs and the possible adaptive devices. She uses her own expertise and knowledge in education and computer technology as well as input from many sources in the school system. Some of the questions she asks include: What are the student's particular barriers to the classroom? What will he or she need to achieve full access and full inclusion? Then she asks, What do the

student and teacher need to know in order to take full advantage of the technology?

After a student's needs have been identified by a teacher, parent, principal, or special educational services, Shubert takes a lead role in matching the instruction access needs to appropriate technology solutions. Shubert's main responsibilities lie in technology identification, purchasing, and training. Additionally, she gets information and support from others familiar with the particular student's capabilities and disabilities. These are the same sources who identify the need in the first place—the classroom teacher, the special education resource teacher, special educational diagnostic teams, occupational therapists, the school principal, and the parents.

Many of the students Shubert has worked with benefit from the use of a laptop computer. One such example is a middle school student, Michelle (a pseudonym). This student has cerebral palsy, which makes handwriting very difficult. By working with this student, her resource room teacher Mandy Tribe, and her subject teachers, the special educational services computer specialist has assigned a laptop computer with word processing software to her. Michelle can take this from class to class to take notes, complete tests, and write reports. With this use of technology, Michelle, Tribe, and others spend less time focusing on Michelle's mechanical handwriting ability and more on her ability to form thoughts.

Planning and Implementation

The foundation for this practice was put in place when Shirley Underwood, director of the department of special educational services, came to the district. Underwood took over the director's job in 1979, fully appreciating the role technology can play for persons with disabilities. The idea that technology "frees" people with

disabilities guides many of her decisions. Her extensive experience with people with severe physical disabilities has proven to her the value of technology. She said, "I always say the severely physically disabled child is the 'man in the iron mask.' That's always what comes to mind. And the computer unlocks the mask. Before technology, the mind was trapped in the body and didn't have a way to get out. Technology has been the way out."

With this foundation of support and the high value placed on technology, the department of special educational services was providing hardware and software to students prior to creating this position. But, Underwood said, "We would stagger around and buy this piece for these people to use and buy that piece for those people to use." It was not a coordinated or efficient process. Often purchases were made, but when the product arrived and was tested, it did not match the need, it was too complicated, or it was incompatible with the equipment they already had. "For a district this size," Underwood said, "I think you lose a lot of money without someone overseeing that program [of purchase, distribution, and use]."

Shubert provides training and technical assistance to the almost 400 special education teachers serving the nearly 4,000 special education students in the Norfolk Public Schools. This includes responsibility for initial set up of computers, training teachers and students in their use, and troubleshooting difficulties.

Ongoing formal training sessions for teachers are held at various times, such as before, during, or after the school day, during summer inservice days, on weekends, or even school holidays. This scheduling increases the attendance and exposure of the ideas to as many individuals as possible. Some of the titles of her workshops and inservice training sessions include: Addressing At-Risk Students Using Technology;

Getting Teachers to Byte: Inservicing Tips; and Grading and Graphing Behavior.

Shubert also conducts informal training one-on-one in classrooms. This usually follows identification of a need and acquisition of a computer for a student. Shubert brings the machine to the classroom and instructs the teacher in its use. Sometimes she helps the teacher adapt classroom procedures. Shubert helps the teacher become more accepting of different methods of instructing in the classroom that use a computer more efficiently. Ms. Shubert also helps show the student how to use the hardware and software.

Troubleshooting involves being on call to provide general hardware and software technical assistance. Sometimes the problem is as simple as an unplugged component or a loose wire. Other times adjustments must be made to the internal switches of a computer. In extreme cases, the machine is sent to the electronics division of the district's school plant facilities department.

Shubert stressed that she operates on a "delivery-based model," not a resource-based model. To her, this means that she does not have a storeroom filled with all the potentially useful computers and devices. Rather, acquisition or allocation only follows the identification of an instructional or access need. Everything is in use in the classrooms.

Shubert said, "We only purchase a certain amount that our budget will allow. And then we prioritize where they will go and we hope to add to it for the other students on the list." She creates a priority list based on four things: the special needs of the student, the school's student-to-computer ratio and teacher-to-computer ratio, and the indicators of past use of current computers. These criteria are also used for new computer purchases.

The success of Shirley Underwood and Pat Shubert in implementing this practice can be partially attributed to the district's current and previous superintendents. Dr. Underwood indicated that both Norfolk superintendents she has worked with have been strong proponents of technology in the schools. Additionally, the support of the electronics division of the school plant facilities department has aided them. This department has given priority to service requests from special educational services, and this practice was extended to the new computers.

Benefits

For many of the students receiving services, affective gains have been seen in self esteem and confidence. These increases occurred because the computer technology reduced barriers in the classroom. The students have said this has helped reduce their feeling of "separateness."

Several teachers of students who have received assistance from Shubert noted several improvements after their students began using computers or other technology. One skill that they have seen improve is composition. With a computer doing the writing, a teacher's attention can be directed at a student's ability to generate thoughts, not at generating letters. The ability offered by computer technology to quickly and neatly delete is very important to the students' self-confidence and self-esteem, teachers said. Teachers also noted that a student can spend more time and effort editing and rewriting ideas, unlike handwriting where the student often becomes preoccupied with erasing mechanical mistakes.

The benefits of delivering technology to students are made possible by the quality training teachers receive. The increased demand on Pat Shubert to deliver training, both formal and informal, indicates the broadening reliance of special education teachers in the district on this position.

Summary

To allow full inclusion of special needs students, the Norfolk Public Schools has supported a specialist to provide training and technical assistance and to coordinate material resources. This position has allowed both teachers and students to develop the skills that are necessary to effectively use the technology provided.

- District size (grades K through 12):
Number of students: 42,000
- Districtwide practice: Number of
special education teachers: 400;
Number of students: 4,000
- Percent of students receiving special
education: 9
- Grade level of students in practice: K
through 12
- Disability classification of students:
All district classifications
- Curricular areas: All subjects
- Technology employed: Various
computer equipment, including laptop
computer and personal word
processors, assistive devices

BUCKS COUNTY INTERMEDIATE UNIT

Technology Specialist Position Supporting Special Education

To efficiently provide services to students with disabilities and their teachers, a technology specialist position is supported by this intermediate unit. Technical assistance is readily available through an itinerant specialist who serves 13 districts in this region, and thus promotes successful technology integration for many special education classes and individual students.

Practice

For the past 9 years the Bucks County Intermediate Unit (IU) has provided a technology specialist position to serve the multiple needs of technology users in its school systems—classroom teachers, other specialists, and students. The responsibility of the IU, one of 29 units in the Pennsylvania regional educational agency, is to provide centralized programs and support services for the 13 school districts in its service area. Funding for the position has come from Federal funds. Bill Ziegler has held this position since it was created in 1983.

The technology specialist makes sure equipment and software available through the IU are well utilized and well suited to the various needs of the special education users. The IUs also function as the liaison agency with the Pennsylvania Assistive Device Center (ADC), and Ziegler is one of three local augmentative specialists who offer assessment and specialized assistance for students with adaptive and assistive devices. Requirements for this assignment are somewhat intertwined with the purposes and functions of the technology specialist role.

No formal job description could capture the demands and changing requirements of the technology specialist position. Ziegler and a number of his supervisors give the general label of "troubleshooter" to the job. The range of his services extends beyond keeping things running, to providing specialized help in the classroom

and to individual students who qualify for his services, giving in-service training to teachers in the region, and even designing software to meet specific needs. Aspects critical to the success of this position are the creativity involved in finding solutions and the responsiveness of the support—where and when it is needed.

Special Education Division Director of the IU, Paul Goode, described his view of staffing the several IU positions related to bringing technology to special education students as "finding the right people, and giving them a little latitude." In addition, Ziegler's affable personality and wide range of abilities (all self-taught) also make him an excellent choice for a position of this type.

Planning and Implementation

Dr. Goode dates Bucks County's focus on technology for special education needs back about 8 or 9 years. The IU was rapidly becoming involved in technology, particularly in investigating the various options for purchasing computers with some available Federal funds. Educators in this county saw the importance and power of technology to provide solutions for students with disabilities. In this context the decision was made by Dr. Goode to develop the technology specialist position to bring the required technical assistance to the IU along with the hardware.

The IU administrators were able to support the technology specialist position with Federal

funding from P.L. 89-313, Supplemental Education Support Services. Other Federal and State monies have also contributed to supporting technology use for special education—especially for equipment purchase. Additionally, the IU has strong support from the ADC for the purchase and loan of assistive devices. (The Pennsylvania ADC is well known for its major role in providing assistive technology to school-aged children. In the 7 years of the long-term loan program's operation, over 700 students have been served.) Ziegler and others at the IU encourage volunteer efforts and seek outside funding. These resources are augmented by a great deal of in-house ingenuity about how to adapt and to salvage to get the most from available dollars.

Bill Ziegler's own interest in technology began in 1980 when he taught himself to program an Apple computer while he was a special education teacher. He began experimenting with an early voice synthesizer and an early touch sensitive board. The IU became aware of his abilities through newspaper accounts of his "hobby" and hired him for the new position.

Dr. Goode's approach is to take people, such as Bill Ziegler, who are self-stimulated and free them up so they can give the best of their talents. He does not think you can order people to do these things; you need to give the interested people the room to use their expertise. This philosophy also influences the flexibility Ziegler has to carry out his job, and in turn, his ability to be responsive. When difficulties or needs arise, teachers and students are confident that problems will be solved because Ziegler's expertise is accessible. Resolution of technical problems is often handled on a "give-Bill-a-call" basis without requirements for formal requests that may cause time delays and too much down time. Ziegler always has his appointment book in his pocket, and manages to find the time that is needed. This often means that the software

development, an activity he particularly enjoys, is left to evenings and weekends and the summer.

Ziegler's schedule often puts him in six and seven schools in a day. He assists classroom teachers both with their hardware and software needs. He also teaches students directly. Ziegler conducts computer classes for students in a residential facility for students with emotional handicaps. He has worked with the students using LOGO and other commercial programs. He also motivates individual students. Bernie, a 12-year-old boy with cerebral palsy, has worked with Ziegler the past 6 years through repeated upgrades of assistive technology. Software development became part of Ziegler's activities when he could not find the software suited to the specialized needs of the population he serves. Beginning with a collaboration with Gail Polzer in developing software for a visually impaired student, Susan, he has been building a series of software programs appropriate for a wide variety of special needs.

These software products are used in special and regular education classes throughout Bucks County and many schools in the United States and abroad. Titles include: *Talking Spelling*; *Voice Prompted Flashcard*; *Large Font Spelling*; *Large Font Flashcard*; *Math Worksheet Generator*; *Test/Tutor* programs for Muppet Keys, Power Pad, Touch Window, Scanning Screen, Keyboard, and Unicorn Board. In designing software, Ziegler begins with a specific need of a teacher or a student that is presented to him. The software is geared to non-technically oriented teachers. It is flexible enough to be appropriate for different physical and learning requirements of different students. These modifications take place on a personalized basis.

A spin-off project of the software development project is the involvement of special education students in product distribution. A work

experience has been created for Trainable Mentally Retarded (TMR) students and physically impaired students in a voc-tech school. Students prepare the disks for Ziegler's software, copy the programs, and preform a quality control check. The sale of these programs funds additional software development efforts.

In addition to the instruction that goes on informally through on-the-spot training during his routine classroom visits, Ziegler provides inservice training. One 2-credit computer course has a 3-hour session devoted to computers and their use with people with disabilities. He also conducts inservice workshops on software that he and his colleagues (such as Polzer) have developed.

Another responsibility that has emerged in this job is overseeing the prison Braille project. Here again he works with Gail Polzer. In this novel project, developed several years ago with the support of prison officials, prisoners at the Bucks County Correctional Center convert books and other written materials to Braille. After electronically scanning and marking the copy, the prisoners use a computer translation program that converts the data file to Braille for visually impaired students. The local Lions clubs provided initial funding for the project and continue to support it. This has been a very successful program for integrating disabled students in the classroom. Prisoners are now assisting other students with special needs in a variety of ways—such as putting their math materials onto the computer.

In an interview, the IU director of special education, Dr. Goode, reflected on the issue of budget cuts and cutbacks occurring in education. He was most concerned about the impact of such actions on the human resources available. He feels that the human resources in place are critical and that human resources could, to some

extent, compensate for reduced material resources, but not vice versa. Ziegler's role is illustrative of the value of the contributions of personnel.

Benefits

Ziegler's availability to special education classes in the region actively promotes the integration of technology into these classrooms. His role also enhances the effectiveness of the use of computers and other devices, as they are specially adapted for the user. Joann Davis, a teacher in a TMR (life skills) class, points out that elementary programs are not appropriate for her students, but that the customized programs have enabled her to reinforce job preparation skills with her class. Both she and the parents of her students have observed (and measured with the records and reports available with Ziegler's software) the students' progress over time. The variety of activities and games available enables a teacher to drill, practice, and repeat certain concepts while maintaining the students' interest level. Students are eager to use the computer every day.

The value of the innovative prison project that Ziegler and Polzer manage is obvious in terms of the students who receive the work products. There are also rewards for the prisoners who work on the project; they are extremely proud of their contributions. Last year for just one student, Susan, they produced 7,000 print sheets. This joint project is an excellent example of extending resources for technology beyond the traditional supports.

Professionals in the IU interested in technology have formed an informal network. They often work together to try new projects and share information. This occurs naturally, and much of the innovation takes place after hours. Ziegler often joins with other colleagues who are in different places during the day to work together

to resolve a problem or to come up with an appropriate solution to a particular need.

Another benefit of the ready availability of expertise is that the IU is able to get the most out of its equipment and maintain the confidence of teachers and students in utilizing the technology. Ziegler also maximizes the life of the equipment or the spending of hardware dollars by his hands-on technical ability. He often buys bulk parts or swaps parts to keep equipment running. He was able to create "home-made" communication boards from surplus Muppet Learning Keys for a cost of about \$13 versus over \$120 that such devices would have cost.

Summary

The technology specialist position is evolving, based on new and changing needs. It has proven to be responsive to both teachers and students. The strong support of the IU administration and its lack of bureaucratic interference have allowed this practice to keep up with the demands and expectations put on the specialist. Administrators in the schools, the districts, and the IU recognize the value of computers, assistive devices, and other forms of technology to enable students with disabilities to expand their environment and to reach their potential.

- IU Service Area: 13 school districts;
Total number of students: 76,000;
Number of students served: 6,000;
Number of IU-operated classrooms: 101
- Age level of students: Preschool - age 21
- Disability classification: Full range
- Curricular areas: All academic subject areas and job preparation
- Technology employed: Computers, adaptive devices, specialized software, page scanner and Braille equipment, interactive videodiscs

CRESTWOOD COMMUNITY SCHOOL DISTRICT

Switches and Electronic Devices for Communication and Environmental Control

To allow students with profound disabilities to communicate and exert some control over the environment, switches with a variety of electrical and electronic devices are employed. The application of this technology in support of a functional curriculum has provided many opportunities for creativity and renewal among the staff.

Practice

The Crestwood Community School District provides educational services for students residing at the Hattie Larlham Foundation nursing home. The Hattie Larlham Foundation began as a 50-bed residential facility for severely and profoundly multiply disabled children 1965. Through several additions and revisions, it has grown to its current capacity of 130. The Foundation accepts individuals aged 3 through 21. Most of the residents function cognitively in the 2 to 6 month range. The Foundation is recognized as a model long-term residential facility for this population. Crestwood Community Schools staff and Foundation staff cooperate to provide appropriate educational services to the children residing at the Foundation.

The goal of the educational program is to increase students' control over their environment and also to increase their communication skills. Children who are able to tolerate transport and a full day of school receive their education in adapted classroom space at the district's high school. Currently, about one-third of the school-aged residents attend the high school program. Those students who are less stable and unable to travel receive educational services in dedicated instructional space at the Foundation.

There is also a preschool program at the Foundation. Preschoolers receive instruction in an area within the residential portion of the building.

The same functional curriculum is used in both locations. Prior to the recent effort to increase the use of technology in the educational program, the staff used a developmental curriculum. Many activities involved sensory stimulation to promote cognitive growth. In this approach, the teachers and therapists were the primary "actors" in educational activities. Teachers and other staff often became discouraged because progress was so slow and activities somewhat limited. Technology has been integral to the recent implementation of the new functional curriculum. Technology allows the children to act, to exert control, and to derive the satisfaction that comes with task accomplishment.

All of the professional staff agree that there is a considerable range in the abilities of their students. Most function at a 2 to 6 month level, although many have receptive language abilities at a somewhat higher level. Because of their severe motor problems, technology has become an important aspect of the educational program. The technology includes numerous electrical and electronic devices. Connected to appropriate switches, these devices allow students to exert some control over their environments and to communicate basic needs and wishes.

Each student uses a switch that works best, given the child's motor and sensory abilities. Switches are selected by therapists and teachers working together. The selection process begins when a child enters the school program, and it is

continually reevaluated throughout the student's involvement in the educational program.

Most instructional activities rely on switches and electrical devices. A variety of switch types is in use, such as pad, leaf, and eyebrow switches. However, most students use either a large pad switch activated by hand movement or a leaf switch activated by head movement. Electrical devices are connected to and controlled by the student's assigned switch.

A key element in the practice is the use of an AbleNet timing device. This device connects the switch with electrical devices, such as tape players for listening to music and stories recorded by family members, televisions, page turners, and adapted toys. Small electrical appliances typically used in daily living, such as mixers, blenders, and fans, are also used a great deal. Anything that can be plugged into a wall outlet can be activated by a switch linked to an AbleNet timing device.

A timer on the AbleNet can be set by the teacher or therapist to remain on for a variable amount of time. The AbleNets allow students to control the appliances, which then offer clear feedback in some sensory modality, providing an opportunity to develop the basic concept of cause and effect. This use also provides opportunities to help students develop some very basic daily living skills as they participate in classroom activities.

Several students at the high school and in the Foundation use Apple IIgs computers equipped with adaptive firmware cards and appropriate switches. The teaching staff has found that some students become highly motivated by working with computers and that using this technology provides experiences that develop basic concepts such as cause and effect.

One of the staff's goals is to make students as

independent as possible by improving their ability to communicate with anybody they are with, not just with the people who know them best. Students and teachers often leave the Foundation or high school to shop in department stores, eat in restaurants, or bowl in the local bowling alley. While shopping, a teacher will work with a student to select clothing, video or audiotapes, or books. Students use whatever communication system they have developed to make their preferences known.

Some students use prerecorded messages on tapeloops with the tape recorders. These tapeloops repeat a short message that may be as brief as "Yes" and "No" or may be statements for specific situations such as "I'd like to buy this now." A favorite teacher's or therapist's voice is used to record the message.

Language boards of various kinds provide some students with an opportunity to communicate more complex messages such as concerns about personal health or choices for classroom or leisure activities. Among these are relatively simple clock-like devices that allow students to choose pictures on a board to make their choices known. In addition, some students are using dedicated communications devices such as the Whisper Wolf or IntroTalker.

Patrick Kavulla, principal of the multihandicapped program and special education administrator for the Crestwood district, stresses that getting the highest level of technology is not the goal—getting the most appropriate technology is. He said:

Our children have many handicaps, but the most serious handicap is communication. We have to develop a system to help them communicate, to get consistent responses from them, to help them control some aspect of their environment. For some children, it's a yes/no type of system. For other children it may be a little more sophisticated.

ed—depending on their cognitive ability. We use lots of electronics, lots of switches. A few children are using a computer to get some reinforcement. We have some real low tech things that are just as meaningful as the high technology because they help the children communicate.

Planning and Implementation

Patrick Kavulla has been in the district since the 1988-89 school year. With a background in speech pathology, he believed that despite their limited cognitive abilities, these profoundly disabled students might be able to learn some basic functional skills and communication skills. He realized that because of the severe motor problems of these students, neither control over the environment nor effective communication would be possible without technology. As a result, he set out to expand the use of technology in the program.

First, he asked his staff what materials they would like to have for the program. They came up with a "wish list." "Since I had the budget," he said, "I started buying lots of electronics. Based upon the opinions of teachers and other professionals on the staff, the AbleNets, switches, and everything else was purchased." The stock of equipment has continued to grow gradually but substantially. They have used funds from discretionary special education accounts and multihandicapped program-specific funds as well as small grants to purchase electronics.

Since his arrival, he has worked closely with two speech/language pathologists, Kathy Lamb from the Foundation and Pam Braden from the high school program. Lamb and Braden receive training outside the district through local and regional conferences on uses of technology in special education programs and through a regional resource center. Vendors also come to the program to train staff members in the use of

their products. Lamb and Braden work together to pass their training on to other staff members, including teachers and occupational therapists.

Important to the success of this push with the new technology was Kavulla's ability to establish cooperative relationships with other administrators in the Crestwood County School District and the staff and administration of the Hattie Larlham Foundation. With his superintendent's approval and assistance, Kavulla's staff worked to revise the curriculum. Also, with the aid of the director of the Foundation, he was able to consolidate the Foundation-based school program in one area, providing the staff with their own space, a sense of unity, and opportunities to work more closely together, and share ideas.

Kavulla continues to encourage his teachers and other professionals on staff to try out a wide range of things that might work with their students. He also provides opportunities for teachers and therapists to learn more about technology options.

Benefits

Providing students with some basic tools to communicate and interact with their surroundings has enriched the quality of the children's lives. They have been given some limited power to act on the environment. The pleasure the children clearly derive is a great satisfaction to those working with them.

Technology has also enriched the experience of teaching these children. It allows teachers to involve students in many more activities, and this has made their jobs more enjoyable. In addition, as Kathy Lamb, speech/language pathologist stated:

These students are so limited mobility wise that switch activation is their only way to have any

kind of interaction with their environment. It's very rewarding to see these severely and profoundly handicapped children respond in a way that you can really see. Technology has really opened a lot of doors. And before there really didn't seem to be any doors to be opened.

Summary

The Crestwood Community Schools made a conscious decision to increase the use of technology in its multihandicapped program so that students would be able to make choices, communicate, and interact with their environment. Staff believe that the increased use of technology has been a real benefit to the children they teach. But importantly, it has enriched the experience of teaching for the staff as they work to create new applications of the technology in the classroom.

- District size (grades K through 12):
Number of students: 2,600
- Number of individuals involved in the practice: Number of teachers: 11;
Number of students: 94
- Age levels of students in practice: 3 through 21
- Disability classification of students: Profoundly multiply disabled
- Curricular areas: Functional skills and communication skills
- Technology employed: Adaptive switches connected to a variety of devices including tape recorders, televisions, page turners, toys, small appliances, communication boards, and computers

MARION SCHOOL DISTRICT

Videodisc To Support Mildly Disabled Students in Mainstream Classes

To support mainstreamed mildly handicapped junior high school students in their academic classes, videodisc and other alternative media are employed. The building principal actively sought the material resources necessary to implement and expand this practice.

Practice

The Marion School District has made a commitment to support students with learning disabilities and other students at-risk for school failure. At Marion Junior High School, technology is a very important part of these efforts. Principal John Heath says, "We've got to reach these children. We've got to use everything that's available to us to maximize the learning opportunities of these children."

Heath has a strong interest in technology and is constantly looking for applications that work and can help students and teachers in his school. As a result, a variety of media, including computer software, videos, and audiotapes, are in use at the junior high school.

Most recently, videodisc technology has become an important part of the instructional support system. The videodisc are mainly used in regular education classrooms, although the resource room math teacher also uses the discs in his classroom. There is also some use of videodisc in the career orientation classrooms and in the guidance programs of the school. The most common use of the videodisc is in whole class instruction.

Videodisc media is not used every day in any class, and it is not a substitute for teacher involvement with students. Rather, it is incorporated by teachers into their overall teaching routines in a way that fits with their individual teaching style. For example, in earth science, one teacher uses a videodisc as an

overview of the subject at the beginning of the school year, while another teacher prefers to use the videodisc to summarize the year's lessons during the last marking period. The resource room math teacher uses the videodisc when he begins a new topic or for review in areas where concepts and skills are not well established.

The school has 10 videodisc players, 9 of which are on carts that allow the discs to be used in different classrooms. Two types of discs are used: structured format and archival format discs. The school currently has 17 sets of discs, 13 of which are in a structured instruction format. Six of the discs are in science, five in math, and the rest in other curriculum areas such as career development.

A structured format program provides instruction to the student, presenting information, asking questions, and providing feedback based on student responses. Following a brief instructional segment, questions on that segment are asked. When used for whole class instruction, students respond as a group, and the teacher controls movement within the program using a hand-held remote. Questions presented at the end of the lesson quiz are answered on paper.

Students also use the structured programs independently during their study hall period and videotapes of lessons from these structured format discs are made available for students to take home. Using either the disc itself or a tape of a particular lesson, it is possible for students who did not understand the material covered in class to review it until they do understand it and

have achieved the desired objectives. In addition, students who have been absent can see material covered in class that they would otherwise have missed entirely.

Archival discs serve as an audiovisual resource for the teacher. These discs contain a mixture of still slides and short motion segments. Teachers use these to convey concepts and information related to the core curriculum in certain subjects. When a teacher uses this type of disc, the primary responsibility for presenting and sequencing instruction remains with the teacher. The disc is a powerful visual aid, that augments, clarifies, and presents information and ideas in an alternative medium.

Planning and Implementation

The staff at Marion Junior High School was looking for ways to effectively support students who were not achieving academically at a level commensurate with their ability, including students with learning disabilities and other students identified as at-risk. The staff believed that alternative media, which better matched the learning styles of these students, could allow them to survive and thrive in their mainstream academic courses.

Principal Heath firmly believed that if appropriate media were available, all students would be able to learn. Heath is generally interested in the possibilities of technology in education, and he keeps abreast by reading a variety of educational technology publications, by attending seminars and conferences, and by networking to find out what other districts are doing with technology.

Heath feels strongly that teachers need to participate in the planning of technology initiatives. He firmly believes that,

If I get excited about something, but they don't get

excited, it's not going to work. We can mandate and legislate, but we have to get the people who are actually going to be using technology to buy in and see it as a viable option to enhance and promote learning.

With this attitude, his approach to adopting new instructional technologies is to create a team of staff members to investigate and determine if a initiative is in fact viable.

During the spring of 1988, John Heath heard about a Tennessee Valley Authority (TVA) dropout prevention demonstration project in Coalfield, Tennessee. The staff in this program was using videodiscs in the instruction of at-risk students. In keeping with his approach, Heath assembled a small team to visit the TVA project. The site visit team included Heath, science teachers Homer Peters and Arthur Rust, guidance counselor Barbara Wood, math teacher Charles Nelson, and media specialist Connie Floring. They reviewed all of the videodisc media in use in Coalfield and talked with those involved in the planning and implementation of its use.

The Marion team was very impressed with the videodisc products being used and became excited about the possibilities for Marion's students. They decided to try to replicate most of what they had seen, and to use the media in their computer labs and special education classrooms, as well as in their regular education classrooms.

Unfortunately, there were no district funds available to purchase the equipment and software needed. However, Heath was not deterred. He says the following about funding problems and his role in solving them:

We haven't had the resources because of a squeeze in state dollars. We've had to improvise to finance our projects. That's where principals have to come in. If they want something, they can't depend on the central office to provide it for them. You have

to look out there for resources that are available, and go for them. It requires time and effort but this is what good managers need to do. We have to go beyond what's available around us and be persistent. If you want something, you go for it, and persist until you get it.

As soon as Heath returned from the visit to the TVA project, he started calling to locate sources of funding for videodisc software and equipment. When he found that there might be Federal funding available through the Job Training Partnership Act (JTPA), he asked a representative from a videodisc developer, Systems Impact, to give a demonstration for local JTPA staff, local vocational education staff, State level department of education staff, and key staff within the Marion district. He then wrote a brief grant proposal describing the equipment and software needed, its cost, and the way in which it would be used. He was awarded the full funding he had requested, approximately \$30,000, several months after he submitted the proposal. All of the equipment and most of the videodisc software currently in use was purchased with this grant. Only 6 months passed between the TVA trip and the receipt of JTPA funding.

Since that time, additional videodiscs have been purchased with other school and district funds, and Heath anticipates that this will continue. From his annual instructional materials budget, he now allocates funds to specific departments so that high quality videodiscs identified by staff can be purchased.

In the fall of 1988, all teachers in the school participated in a 2 day workshop. On the first day, the training session was led by John Heath, and on the second day, by a training consultant from outside the district. This training was to give teachers some basic knowledge and skills for using videodisc in instruction.

Teachers and other staff reported that the amount of training required to use videodisc effectively in instruction was minimal. John Heath believes that this ease of use is one of the best things about videodiscs.

Benefits

John Heath and staff involved in using videodiscs believe that it is a valuable addition to their instructional program—one that helps students with learning disabilities and other students at-risk of failure to survive in the mainstream by presenting information in a way that these students can absorb and process effectively. They believe that tool this has helped students to make higher marks in their mainstream classes, to improve on standardized test scores, and to feel better about themselves and their ability to be successful in school.

Teachers' perceptions of students who learn differently have also changed, because they now have a tool that can help these children learn. They can really see that people learn differently, not simply better or worse.

Marion Junior High School staff discovered that the grades and test scores of average and below average students rose significantly in classes where videodiscs were in use. For example, in earth science 40 percent of all students were getting Ds or Fs. With videodiscs in use, they were able to reduce the failure rate to 10 percent.

During the first year that the videodiscs were in use, student scores on the Metropolitan Achievement Test increased substantially. The scores in science where the media is used most intensively and extensively rose significantly on this achievement test (nearly 20 points).

Teachers have also been very impressed not only with the reduction in the failure rate but also with the attentiveness and involvement of their

students. Heath additionally notes that, with this technology available, teachers may also become more involved with their students. It allows them to become managers of instruction rather than disseminators of information.

Heath and others have also observed that the achievement increases since the introduction of videodisc have improved the self-esteem of low-achieving students. As Heath says:

We've found that these kids really like it. Kids that before were making 25 or 30 percent on tests are now making 85. And, it changes their whole outlook on learning. It changes their feelings about themselves. I don't know if what we're doing here is innovative. We just know that it works. And we're excited about that.

Summary

Staff at Marion Junior High School made a decision to introduce videodisc into the instructional program to support mildly handicapped and other at-risk students in academic subjects. Principal John Heath actively pursued funding to acquire the necessary material resources. Staff believe that videodisc has been a valuable addition to their program, one that is easily incorporated into whole class instruction and has resulted in significant achievement gains for students.

- District size (grades K through 12): Number of students: 2,600
- School size of practice location (grades 7 through 8): Number of students: 380
- Percent of students receiving special education services: 11
- Grade level of students in practice: 7 through 8
- Disability classification of students: Learning disabled, at-risk
- Curricular areas: Mathematics, science, career orientation
- Technology employed: Videodisc

PALM BEACH COUNTY SCHOOL DISTRICT

Telecommunications for Instructional Access

To increase the independence and speed of access to instructional material for students with visual impairments and students with physical disabilities, screen reading software and hardware and voice input software and hardware are combined with electronic telecommunications. Involving many different departments in the adoption and integration of new technology can improve the use of the technology. This project, which provides students with work-related skills, is a joint effort of the special education and vocational education departments.

Practice

In Palm Beach County, Florida, a districtwide electronic bulletin board system (BBS) is provided to students who are blind or visually impaired or who have physical disabilities to increase the speed of their access to instructional materials. While the visually impaired students rely on adapted output technologies, the physically disabled students use alternative input technologies. Screen reading software and hardware enables students with visual disabilities to electronically interact with their teachers, fellow students, peers across the country, or anyone in the world using telecommunications. Students with physical disabilities access the BBS with voice input software and hardware. The aims include increasing their confidence and self-reliance, their access to instructional materials, and their vocational opportunities.

Herman Matos is a technology specialist and special needs coordinator in the vocational/technical education department. Matos was the first local BBS system operator (sysop) and FidoNet sysop in the Palm Beach County school district. He created the Palm Beach Voc/Tech BBS Echo Network for teachers. In addition to providing inservice training and technical assistance, he provided access to the K-12 Educational Network. District educators and students use this network to post and read electronic messages around the world dealing with education-related topics,

including math, science, computer education, biology, and foreign languages. There are also several boards for students.

With assistance from Janeen Clinton, an instructional technologist from the Florida Diagnostic Learning Resource Service, (FDLRS/ALPHA), Matos has developed this instructional application of telecommunications technology. The goal was to meet the current instructional needs of some students, while at the same time helping them to develop skills useful in the work environment.

At Santaluces High School, Jason and Amy, two blind students, read Grade 2 Braille. Each also owns a Braille 'n Speak device. With the proper screen reading software, the Braille n' Speak vocalizes text on computer screens. The students also use it as an alternative keyboard to enter commands. By connecting the device to a modem-equipped computer, they are able to access electronic bulletin boards.

Before this practice, classroom assignments and handout sheets were Braille-typed for Amy, Jason, and Scott, a visually impaired student, by their itinerant teacher, Peg Marston. Now Marston types their assignments into a computer and loads the files onto the Voc Tech BBS Network. Alternately, any typewritten handout can rapidly be made into a computer file when fed into a full page scanner and translated with

optical character recognition software. At home or at another computer in the school system, the blind or visually impaired students retrieve this file from the BBS and have the Braille 'n Speak read it aloud. Files can also be printed out on Braille printers. It is possible for regular classroom teachers to generate Braille files. In this way, the student individually receives, completes, and turns in written classroom assignments.

At another high school, John I. Leonard, the BBS has been introduced to a class for students with physical disabilities. One student, Melvin, is quadriplegic as the result of an accident. Matos has instructed Melvin in using the BBS. In the summer of 1991, he received *Dragon Voice Dictate*, a voice recognition system, to interact with the computer. Melvin now independently logs onto the BBS, obtains assignments, reads messages, and responds to students in other schools, states, and countries.

Planning and Implementation

The BBS began in the 1988-89 school year. Kate Gildan, director of vocational/technical education, wanted to increase the use of computers as instructional tools. Gildan hired Matos to help vocational teachers become computer literate and to help them integrate the computer into the curriculum. Matos traveled around this 2,500 square mile district in the evenings, holding workshops in the community schools and technical centers.

Telecommunications was brought to the district by Matos as an efficient mechanism of providing long distance learning and inservice training for teachers in this large district. Rather than driving around the district in the evenings, he began offering teachers one-on-one evening and weekend tutoring through the BBS. In addition to receiving lessons and information over the phone lines, the teachers were also able to easily

interact with each other, brainstorm solutions to problems together, and share ideas among themselves and with teachers around the world.

Budget cuts required that Matos' new position be eliminated in school year 1989-90. At the same time, however, a federally funded vocational specialist position to assist disabled students became vacant. Gildan remembers thinking, "Herman [Matos] could fill that slot unbelievably well. Instead of working with pencil and paper, the students could work with the electronic bulletin boards and modified machines in order to enter the economic mainstream." She thought it was "fortuitous that two things opened at the same time—Herman's availability and this position."

Matos was concerned at the time of this switch because he did not consider himself knowledgeable about special needs populations. However, he is constantly in touch with various special education experts through his telecommunications on FidoNet resources, and he experiments with computer hardware and software configurations. Matos relies primarily on Clinton to understand the needs of exceptional students. "We've talked about all the various exceptionalities, the behavioral characteristics, and cognitive learning needs of these kids because I'm not an expert [in special education]," he said. "I depend on her vast experience."

Early in the 1990-91 school year, Marston was discussing Jason's progress and his interest in telecommunications with Clinton. Clinton told Marston that Matos was working with telecommunications. Together, they asked Jason if he was interested in meeting Matos. Within an hour Matos was talking with Jason about using electronic bulletin boards. "I went down and met with the student and the teacher," Matos said. "He explained what he was interested in and I asked him questions. The light came on in

my mind and I said, 'You know, this would be a fabulous way to provide the visually impaired students instruction.' That's how I really started concentrating on the instruction of handicapped students."

In watching Jason interact electronically with others on the bulletin board, Matos, Clinton, and Marston saw this as an answer to issues of access to instructional materials. They also recognized the potential benefits to the students' self esteem and level of independence as well as implications for future employment.

The exploratory nature of the beginning of this practice was aided by vocational/technical director Kate Gildan. She said Matos was "given a great deal of leeway to create and innovate" in the position, and that she gave him opportunities to develop professional relationships within the district to further his efforts. For instance, she had Matos attend district committees dealing with vocational education, special needs, and technology. It was at the superintendent's committee for special needs that Matos met Mona Jensen, the principal of Santaluces High School. Jensen was interested in providing new opportunities to her special needs students, and she was receptive to Matos' ideas about telecommunications. Recognizing the potential along with Clinton, Marston, and Matos, and helped establish the practice in her school.

Jensen's support was instrumental and necessary because the district operates under a policy of school-based management; the selection and acquisition of most resources is conducted at the school level. Financing most new purchases means demonstrating the usefulness of an idea. Personal networking is relied on to discover the availability of resources and to influence allocations.

To assist the use of the BBS, Jensen moved the

visually impaired classroom to a larger room in the building and provided the necessary dedicated phone line for the equipment.

Since its beginning, the practice has expanded to include other visually impaired students at Santaluces; Melvin and other students at John I. Leonard; and other students with disabilities in the district.

Benefits

The students involved have increased the degree to which they are independent. They have said they like the increases in independence, and they like interacting with others. Their self-esteem has increased and they communicate more. For example, according to Clinton, Jason in particular has become more extroverted. Students have also increased the amount of their writing and improved their language arts skills.

They also have a much greater likelihood of employment now. In fact, they have begun to explore potential careers that they probably would not have considered before. For example, Matos hopes to educate Melvin in computer-assisted design. Matos sums up the vocational utility of the practice this way:

The problem is they won't get the job unless they can demonstrate they have the skills, and the employer won't spend the money up front to find out if they have the skills. So, if you have a lab where they can demonstrate their skills, or if they can bring a video of them demonstrating their skills, they may be able to get a job easier.

Matos believes this practice shows great potential for other disability groups. For instance, he expects that the BBS will reinforce language arts lessons for students with hearing impairments when they are introduced to the technology.

Additionally, there has been an increase in the amount of communication across the

vocational/technical department, the exceptional students education department, and the district computer services department. This will likely continue, easing the adoption of practices like this that need support from several departments in the district.

Summary

When administrators and other staff members come together from different departments and different levels with a common interest, many important improvements can be made in the educational programs for students with disabilities. This effort to provide improved access to instructional materials and to begin to develop vocational skills is an example of what this kind of collaboration can accomplish.

- District size (grades K through 12): Number of teachers: 7,500; Number of students: 106,000
- School size of practice location (grades 9 through 12): Number of teachers: 200; Number of students: 2,800
- Percentage of students receiving special education services: 13
- Grade level of students in practice: 10 through 11
- Disability classification of students: Visually impaired and physically disabled
- Curricular areas: All academic subjects
- Technology employed: Modern equipped computers, screen text speech synthesizer, and electronic bulletin board software

**RESOURCE MATERIALS CENTER FOR THE HEARING IMPAIRED
FLORIDA SCHOOL FOR THE DEAF AND THE BLIND
Statewide Training and Technical Assistance to Increase Technology Integration**

To realize the goals of technology and its integration into school settings, opportunities to receive high quality training and technical assistance must be easily accessible and efficiently provided. To this end, the Resource Materials Center for the Hearing Impaired provides the necessary resources, technical assistance, and training in the use of technology to teachers of students with hearing impairments throughout the state of Florida.

Practice

The Resource Materials Center (RMC) is a specialized center in the Florida Diagnostic Learning and Resources System (FDLRS) exclusively serving the hearing impaired population and their teachers and administrators in the state. The RMC and its two component centers are housed in the Instructional Technology Building of the Florida School for the Deaf and the Blind (FSDB) at their campus in St. Augustine.

In the spring of 1991, the Computer Resource Center (CRC) and the FDLRS Educational Television and Captioning Center at FSDB were combined to form the RMC to provide technology training, technical support, and materials. Previously a distinct statewide program at FSDB, the CRC was created by the State legislature in 1984 to increase the use of technology with the low incidence populations of students with visual or hearing impairments. Changes in the CRC funding in 1989 restricted the focus to programs for the hearing impaired. Also previously a distinct program, the Captioning Center collects, captions, and distributes educational videotapes throughout the state for the hearing impaired.

The decision to consolidate the programs was made to maximize resources, to avoid overlap and duplication of services, and to streamline management of the two facilities under the

instructional technology department. The bulk of this profile deals with the activities of the Computer Resource Center of the Resource Materials Center.

Within the CRC there is a firm commitment to helping teachers acquire the skills needed to teach students to use technology. Three initiatives have been developed to reach this goal: a software evaluation guidebook, a demonstration project, and general training efforts.

Planning and Implementation

In 1984, the director of the instructional technology department at FSDB, Bob Graham, hired John Mark Leach to oversee the CRC and measure the current level of use of technology with students with visual or hearing impairments. He was also directed to examine the potential need to increase the level of use. At the time, technology was becoming more prominent and the survey results indicated that students with hearing impairments could benefit from an increased use of technology. Trainer Bob Stern, technician A.J. Willis, and others were added to the staff.

There were originally two major efforts—one for the deaf programs and one for the blind programs. According to Leach, "The deaf have a need to understand what they are reading; the blind have a need to get to something to read."

This translated into two fundamentally different approaches by the staff of the CRC. Leach said, "In the area of deaf, we look at evaluating software and providing inservice training on how to utilize that software." Because the issue with the blind is access, the CRC staff helped to provide needed additional hardware, such as vocalizing on-screen text and Braille printers.

One of the early approaches for the hearing impaired component of the program was to distribute three computers each to seven classrooms around the State. With the software the CRC provided, teachers were asked to evaluate the technology and report their experiences to the CRC. This knowledge helped the CRC assist other teachers.

Even with this success, Leach said:

We began seeing the need to focus more on inservice training. We had run into some resistance. We would try to put something on top of that curriculum, but we really needed to go into the curriculum. Teachers had so much to do, that asking them to do more was unrealistic. We didn't have enough sensitivity to all that teachers were doing. We're now actually trying to have the teachers do less and we believe they'll do more. That's kind of a philosophy we have. It's not what's the least they can do, but what's the smallest amount of information we can give them that will make the biggest difference in what they are doing.

They discovered that teachers need training as well as resources to help integrate the technology into the classroom. In fact, for both the deaf and the blind populations, training in hardware and software became a major focus. Within six months of the first fully staffed year (1985), they provided training to accompany all distributions of hardware and software to teachers and students as well as other training.

Following the removal of the blind component in

1989, they have continued with their hearing impaired component with the three initiatives of the guidebook, the demonstration project, and general training efforts.

The software guidebook grew from the CRC's finding that much educational software has language and vocabulary levels too sophisticated for the average hearing impaired student. The teachers also did not have the time required to evaluate all the software available. The CRC staff created a statewide system for evaluating software appropriate for hearing impaired students. Fifteen to 20 teachers and their students try out, evaluate, and document software. These recommendations are catalogued in a guide of software that helps students improve their language and problem solving skills. The guidebook is updated annually and distributed to every teacher of hearing impaired students in the State. It has become an important resource for teachers and administrators in programs for students with hearing impairments.

The software evaluation guidebook is supported by the demonstration project. Demonstration classrooms have been established statewide to develop and disseminate methods of integrating the selected software and computers.

Bob Stern identifies teachers who have experience in successfully using technology in their classrooms. He said, "I trust in them to do special projects. The things they do can be shared with others around the state." Stern describes the three levels of participation in the demonstration project:

We have the first level of teachers coming into the project who will become software evaluators. They look at how to integrate computer technology into the classroom so they can do a fair evaluation. Because they are going to be learning how to identify good software, they are going to become

better users of technology.

After these folks have had some experience, they move into the second level and become a demonstration site. I will give them specific software that matches their curriculum so they can produce some classroom ideas and methods. The next level is for them to build some hypermedia stackware of their own that will be shared with other teachers around the state. Of course, we train them in how to do that.

After the tools, techniques, and experiences have been collected and reviewed by Stern, they are distributed through conferences, workshops, and one-on-one training. The ideas give teachers a starting point for using computers in all subjects. "Teachers are teaching teachers how to become better users," Stern said. "And I think that is very important—that it is coming from the same understanding and level."

The third and most central initiative of the CRC is the training and support for the use of computers and other technology by students, teachers, and administrators in effective uses of applications in curriculum areas, management, software evaluation techniques, and development of instructional materials. The CRC staff firmly believe that training is critical to effective technology implementation. They have found that the best way to hook teachers on using technology is to show them how the technology can help them and how it can make their lives easier. And they have found that training needs to be provided for both classroom personnel and administrators, because their vision and goals for the education of children should be in concert, not going in different directions.

Leach said, "Look at the literature and see why technology has made a difference. Most every article is going to say training. Others have told me that some computers just sit in the classroom because the teachers haven't been trained. We work with our teachers in our State." Stern

added that "Well before the whole philosophy of computers in education turned to training, we were doing that within the state: preparing the teachers. Trying to forget the kids for now, get the teachers comfortable with using that technology. And it has made a big difference with a core group of teachers."

Stern holds teacher workshops in the CRC's computer lab at FSDB and in classrooms around Florida. During one of the most popular workshops, called "Frustration Fair," Stern increases the teachers' abilities to solve common problems of the technology. For example, he will intentionally disable a computer and instruct the teachers in step-by-step processes used to diagnose the problem and then show them how to fix it.

Leach trains administrators. "We found that no one else was working with administrators, so we began expanding," Leach said. "We stayed with hearing impaired programs, but we're broadening our understanding. Now I'm working more with the administrators and seeing how we can get them involved."

In Stern's view, administrators have to use technology in order to understand the needs and to be supportive. He said, "You can't hand a student a pencil for 15 minutes a day, or a week, and then expect his handwriting to improve. It's the same thing with the computer. And a non-using administrator doesn't understand that."

Technical assistance is provided to augment the training. Early on, Bob Graham recognized the need for technical support and hired A.J. Willis. Willis creates solutions to technical problems such as cable compatibility or adapting specialized devices. (For example, he hard wired FSDB's first large screen computer monitor using a television.) The CRC then shares these solutions. Stern said, "We don't necessarily fix all of their equipment, but we provide them all

the support that we can. And this is especially important because when there are problems—and there will be problems—we have the technical support to follow up on the training and build or modify anything that's needed."

Benefits

The CRC has developed into a critical resource. Stern said,

One thing that's real interesting around the state is to see how the administrators in the local schools look to the people we've worked with around the state for technical assistance. It's amazing. A lot of times, a teacher will call me and say that their principal is looking for such and such technology and they ask me where they might get it. So not only do they become the experts in their school, the teachers become a technology resource for regular education in the school.

To the RMC staff, it makes economic sense to provide these services at the state level. Bob Graham, John Mark Leach, Bob Stern, A.J. Willis, and the other staff members at the Resource Materials Center are convinced of the value of their efforts and have watched many teachers and administrators become more comfortable with technology, to the benefit of students.

Summary

Successful implementation of technology into the curriculum is based on maximizing teachers' effectiveness in developing instructional uses, applying them to the classroom, and disseminating relevant experience to others. The staff of the Computer Resource Center at the Resource Materials Center at the Florida School for the Deaf and the Blind have recognized this need to assist teachers in addition to providing technology. They have responded by providing quality resources, accessible training opportunities, and efficient technical assistance to the benefit of students with hearing impairments throughout the State.

- Statewide service for grades K through 12
- Serving 2,500 students and their teachers and administrators
- Disability classification of students: Hearing Impaired
- Curricular areas: All areas
- Technology employed: Video, computer, adaptive devices, specialized software